

## New ARM720T 90 MHz Embedded Processor Allows Faster than Real-Time Recording

### EP7312-90 Features

- ARM720T processor
  - ARM7TDMI CPU
  - 8 Kbytes of four-way set-associative cache
  - MMU with 64-entry TLB (translation look-aside buffer)
  - Write buffer
  - Thumb code support enabled
- 90 MHz & 74 MHz clock speeds
- MaverickKey™ IDs for DRM
  - 32-bit unique ID
  - 128-bit random ID
- Ultra low power
  - Designed for applications that require long battery life while using standard AA/AAA batteries or rechargeable cells
  - Typical power numbers
    - 90 mW at 74 MHz typical
    - 108 mW at 90 MHz typical
    - <.03 mW in the Standby State



The EP7312-90 is one of the world's fastest ARM-7 embedded processors today—with clock speeds of up to 90 MHz, it allows for real-time MP3 encoding, as well as decoding for all major digital music standards. The EP7312-90 also supports WMA, MP3, and AAC playback. With faster than real-time MP3 encoding capability, the need for a personal computer to create digital audio content is eliminated. Now, manufacturers can easily build portable rotating media and flash-based audio players that record and store CD/MP3 data during playback—more than ten hours of music content to be stored on a single CD-RW disc.

The EP7312-90 delivers high performance with low power, permitting advanced user interfaces and operating systems in battery powered entertainment devices. A digital audio interface (DAI) provides a glueless connection to today's most popular DACs and ADCs, enabling scalable audio performance and price points. It also includes our patent-pending MaverickKey™ technology, which provides consumer Internet product manufacturers with on-chip security utilizing specific hardware IDs, such as those assigned for DRM or other authentication mechanisms.

Design in the EP7312-90 for a wide range of consumer entertainment products, including portable and set-top digital audio devices, car audio jukebox systems, as well as general-purpose controller applications.

## EP7312-90 Features (cont.)

- Advanced audio decoder/decompression capability
  - Allows support of multiple audio decompression algorithms
  - Supports MPEG 1, 2, and 2.5 layer 3 audio decoding, including ISO compliant MPEG 1 and 2 layer 3 support for all standard sample rates and bit rates
  - Supports bit streams with adaptive bit rates
  - Improved DAI (Digital Audio Interface) providing glueless interface to low-power DACs, ADCs, and CODECs
- SDRAM controller
  - Supports two memory banks of up to 256 Mbits in size
  - SDRAM memory interface is programmable from 4 to 32 bits wide
- LCD controller
  - Interfaces directly to a single-scan panel monochrome or color STN LCD
  - Panel width size is programmable from 32 to 1024 pixels in 16-pixel increments
  - Video frame buffer size programmable up to 128 Kbytes
- Memory controller
  - Decodes up to 6 separate memory segments of up to 256 Mbytes each
  - Each segment can be configured as 8, 16, or 32 bits wide with support for page-mode access
  - Programmable access time for conventional ROM/SRAM/FLASH memory
  - Supports removable FLASH card interface
  - Enables connection to removable FLASH card for addition of expansion FLASH memory modules
- 48 Kbytes (0x9600) of on-chip SRAM for fast program execution and/or as a frame buffer
- Two synchronous serial interfaces
  - ADC (SSI) Interface: Master mode only; SPI and Microwire1-compatible (128 Kbits/s operation)
- 27 general-purpose input/output pins
  - Three 8-bit and one 3-bit GPIO port
  - Supports scanning keyboard matrix
- Two UARTs (16550 type)
  - Supports bit rates up to 115.2 Kbits/s
  - Contains two 16-byte FIFOs for TX and RX
  - UART1 supports modem counter signals
- SIR (up to 115.2 kbps) infrared encoder
  - IrDA (Infrared Data Association) SIR protocol encoder/decoder
- DC-to-DC converter interface (PWM)
  - Provides two 96 kHz clock outputs with programmable duty ration (from 1-in-16 to 15-in-16) that can be used to drive a DC to DC converter
- Two timer counters
- Evaluation kit with schematics, sample code, and design database
- Support for up to two ultra-low power CL-PS6700 PC card controllers
- Dedicated LED flasher pin from the RTC
- Full JTAG boundary scan and Embedded ICE support
- Commercial and Industrial temperature range
- Optimized for low power dissipation and fabricated on a fully static 0.25 micron CMOS process
- Available in 208 LQFP, 256 PBGA, & 204 TFBGA

## Overview

### Power Management

The EP7312-90 is designed for ultra-low power operation. Its core operates at only 2.5 V, while I/O has an operational range of 2.5 V to 3.3 V. The device has three basic power states:

**Operating**—This state is the full performance state. All the clocks and peripheral logic are enabled.

**Idle**—This state is the same as the Operating State, except the CPU clock is halted while waiting for an event such as a key press.

**Standby**—This state is equivalent to the computer being switched off (no display) and the main oscillator shut down. An event such as a key press can wake-up the processor.

### MaverickKey™ Unique ID

MaverickKey unique hardware programmed IDs are a solution to the growing concern over secure web content and commerce. With Internet security playing an important role in the delivery of digital media such as books or music, traditional software methods are quickly becoming unreliable. The MaverickKey unique IDs provide OEMs with a method of utilizing specific hardware IDs such as those assigned for DRM (Digital Right Management) or any other authentication mechanism.

Both a specific 32-bit ID as well as a 128-bit random ID is programmed into the EP7312-90 through the use of laser probing technology. These IDs can then be used to match secure copyrighted content with the ID of the target device the EP7312-90 is powering, and then deliver the copyrighted information over a secure connection. In addition, secure transactions can benefit by also matching device IDs to server IDs. MaverickKey IDs provide a level of hardware security required for today's Internet appliances.

### Memory Interfaces

There are two main external memory interfaces. The first is the ROM/SRAM/FLASH-style interface that has programmable wait-state timings and includes burst-mode capability, with eight chip selects decoding six 256 Mbyte sections of addressable space. For maximum flexibility, each bank can be specified to be 8, 16, or 32-bits wide. This allows the use of 8-bit wide boot ROM options to minimize system memory requirements and cost, the ARM Thumb instruction set is supported providing for the use of high-speed 32-nbit operations in 16-bit op-codes and yielding industry-leading code density.

The second is the programmable 4 or 32-bit-wide SDRAM interface that allows direct connection of up to two banks of SDRAM, each bank containing up to 256 Mbits. To assure the lowest possible power consumption, the EP7312 supports self-refresh DRAMs, which are placed in a low-power Standby State.

A DMA address generator is also provided that fetches video display data for the LCD controller from main SDRAM memory. The display frame buffer start address is programmable. In addition, the built-in LCD controller can utilize external or internal SRAM for memory, thus eliminating the need for SDRAMs.

### Digital Audio Capability

The EP7312-90 includes its powerful 32-bit RISC processing engine to implement audio decompression algorithms in software. The nature of the on-board RISC processor and the availability of efficient C-compilers and other software development tools ensures that a wide range of audio decompression algorithms can easily be ported to and run on the EP7312-90.

### Serial Interfaces

The EP7312-90 includes two 16550-type UARTs for RS-232 serial communications, both of which have two 16-byte FIFOs for receiving and transmitting data. The UARTs support bit rates up to 115.2 kbits/s. An IrDA SIR protocol encoder/decoder can be optionally switched into the RX/TX signals to drive an infrared communication interface directly.

### Improved Digital Audio Interface (DAI)

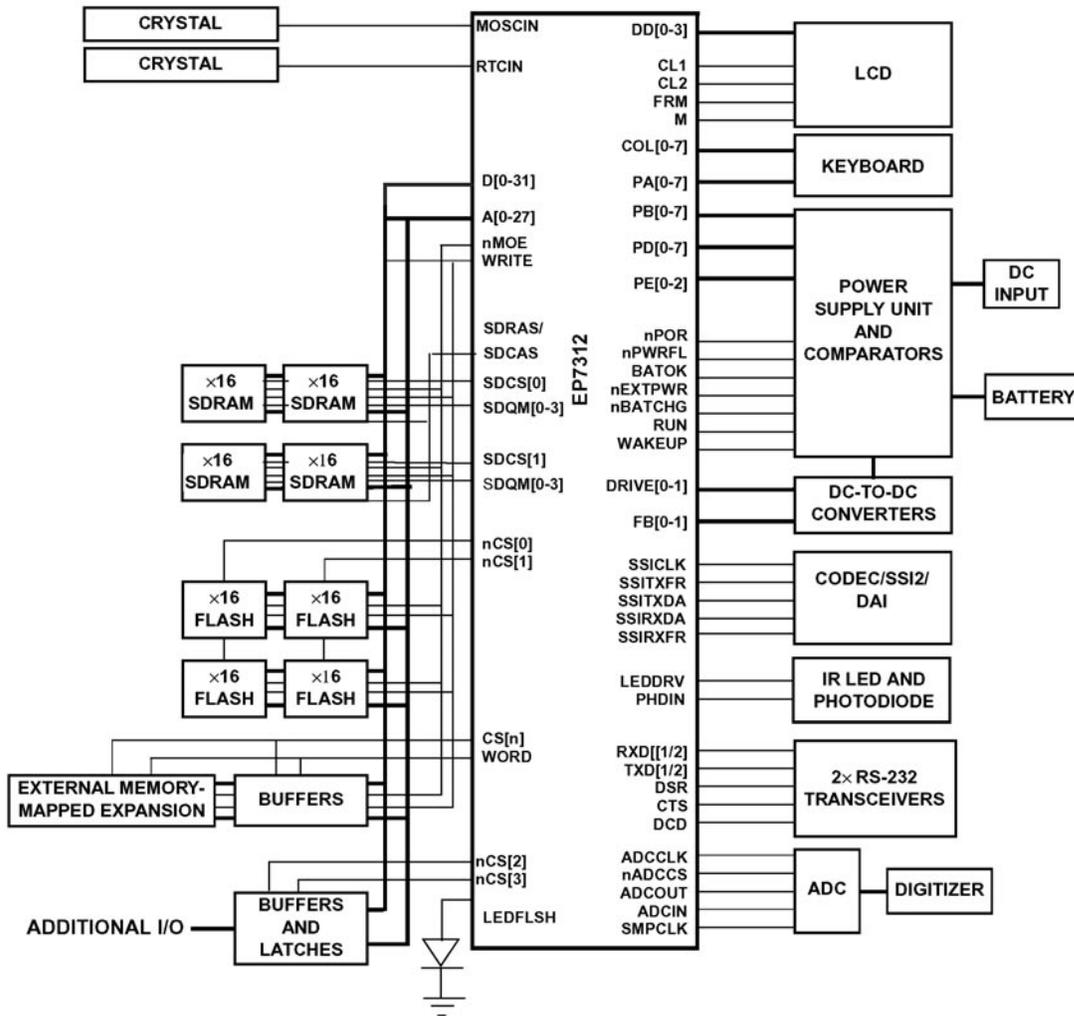
The EP7312-90 integrates an interface to enable a direct connection to many low cost, low power, high quality audio converters. In particular, the DAI can directly interface with the Cirrus CS43L41/42/43 low-power audio DACs and CS55L32 low-power ADC. Among the features for these devices are: digital bass and treble boost, digital volume control, and compressor-limiter functions.

### Packaging

The EP7312-90 is available in a 208-pin LQFP package and a 256-ball PBGA package.

### System Design

As shown in the system block diagram (page 4), simply adding desired memory and peripherals to the highly integrated EP7312-90 completes a low-power system solution. All necessary interface logic is integrated on-chip.



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